

PATHWAYS

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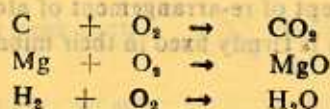
Balancing A Chemical Equation

Students generally find it difficult to balance chemical equations. Here is a simple game (as well as teaching aid) which teachers can use, initially for explaining how to balance the equation. Later on, children can use the same for practise.

Take a cardboard of about 120 cm × 60 cm dimension and cover it with velvet paper of any colour. This will be your flannel board. If you have one in your school you need not prepare this.

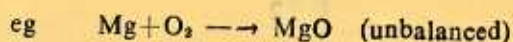
Cut out about 50 squares each 2.5 cm × 2.5 cm from a chart paper. Later on you can add more depending the number of equations you want to make your students practise. At the back of each square put a little gum or Fevicol and sprinkle a little sand on it. When the gum dries up, the sand sticks on the paper. You can otherwise paste a small piece of sand paper at the back of each card.

Now choose the equations. Suppose you want to start the simple equations like.

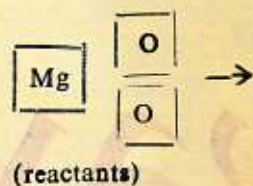


You will require C, H, O, Mg atoms. With the help of sketch pens write down these atoms on the cards - one atom on each. Make them in sufficient numbers. Make some plus and signs and some arrow signs also.

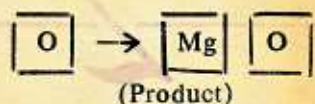
Put your flannel board up on one side of the black board. Choose any reaction and write it on the black board.



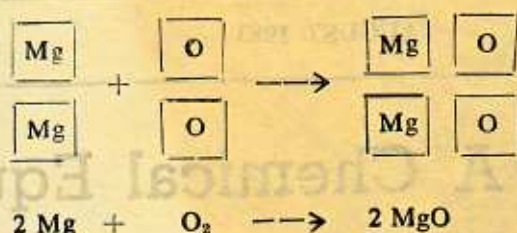
Next pick up your cards and fix the reactants as follows on the flannel board.



As you know the number of atoms of each kind in the reactants is equal to the atoms of the product. So start shifting the cards from the left hand side to the right hand side to form the product.

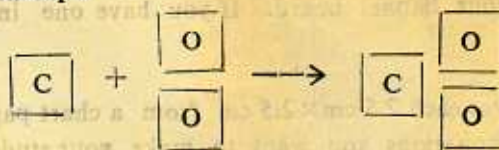


Your equation will be balanced only if all the atoms are shifted to the right hand side. Here the above equation is unbalanced as one O atom is left. This can combine with another Mg atom. So we can rearrange our equation, adding more cards to the flannel board.



When the 'reactant' cards are shifted to the 'product' side, nothing is left over. Such an equation is balanced.

You can take another example



Once you have done some equations in the class, make a set of small envelopes with cards in them and an unbalanced equation written on a paper. Ask the students to choose their partners. Distribute these envelopes so that one student asks the other to balance the equation written on the paper. Later on they can exchange the cards. This will give them sufficient practice and keep them engaged for quite some time. The concept of re-arrangement of atoms during a chemical reaction and the skill of balancing chemical equations is firmly fixed in their minds.

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Teaching-Learning Strategies & Techniques For Primary Classes Using Newspapers & Magazines

Children, when introduced into the habit of handling newspapers and magazines informally will unconsciously get interested in reading them. Here are several interesting ways of using newspapers and magazines.

I. MATHEMATICS :

1. Learn to count by turning pages.
2. Find sets to teach numbers-5 spoons, 8 handbags and so on.
3. Cut out money amounts from Ads. Match up with real money.
4. Find and cut out basic shapes from the newspaper - rectangles from television Ads, circles, stars and squares and so on.
5. Take a picture and paste it on a chart paper. Have students to fold it into exactly half, to teach symmetry. To teach that two halves make one.
6. Make up a jigsaw puzzle by cutting up up a large picture and pasting it on a cardboard.
7. Puzzles and riddles can be used in the class
8. Drilling basic concepts:
 - a. size—biggest, greatest, long short, tall etc.
 - b. location—low, high, top, bottom.
 - c. quantity—minimum, maximum, most, many, all, few.
 - d. time—today, tomorrow, next week winter, this week, next year.
 - e. value—100% wool, feather light, all silk, full width, true weight, and others.
9. Drill addition and subtraction from sales figures in Ads.
10. Scale drawings and its common usage from the study of routes, maps and plans.

11. Statistical graphs: from given data, pie chart, histogram, picture chart etc.
12. Study the recipe page in a women's magazine.
 - a. make $\frac{1}{2}$ of a recipe.
 - b. make $\frac{1}{3}$ of a recipe.
 - c. make double of a recipe.
13. Use obituary to compute the average age of death for a day or week.
14. Measure the length, width, perimeter and calculate the area of a page.
15. Look up advertisements for jobs. Compare the salaries of jobs of the same level.

II. SCIENCE

1. Cut out pictures and classify them into plants, animals etc.
2. Make up a weather chart.
3. Read a report on any scientific topic and make students prepare a scrap book on the topic.
4. Clip and file articles about outstanding scientists and their contributions.
5. Discuss articles about forces that change the earth's surface - floods, earthquakes, winds, storms etc.
6. Study the advertising claims of patent medicines.
7. Prepare a science vocabulary, dictionary of words as they appear in the newspapers.

III. LANGUAGE

1. Learn to match capital and small letters.
2. Find the letter, starting the child's own name. Match this with other words starting with the same letter.

3. Build a family from the pictures in the newspaper.
4. Cut out pictures of people who help in the community-Policeman, Fireman, Doctor etc.
5. Show a picture in the paper. Tell a story about it.
6. Cut up comic strips and have children put them in a sequence.
7. Find all words that begin with the same letter.
8. Cut out pictures and match them with words.
9. List down words that describe emotions-happy words, sad words, angry words etc
10. Cut out a part of a picture. Have children discuss what is missing.
11. Cut out pictures of animals. Ask children to make sounds that go with them.
12. Take a classified Ad Page. Colour each block of Ad in a different colour.
13. Show a picture. Utter one word which rhymes with a prominent object in one of the pictures and the children will have to find the object with which it rhymes.
14. They could extend this to find other rhyming words—toy, boy, man, pan.
15. Build a word bank with new words discovered in a news story. Write the words, and the meanings underneath.
16. Collect several new words each day and at the end ask them to arrange them in a dictionary sequence.
17. Ask children to underline, each with a different colour—doing words, naming words describing words etc.
18. Use the sports page and study the positions of athletes-running, jumping, throwing etc.
19. Study and discuss facial expressions.
20. Use pictures to help in the study of phonetics:
 - a. begin with same sound,
 - b. end with the same sound.
 - c. contain a small word—and, on, an, end etc.
21. Collect words which have the same or opposite meanings.

IV. SOCIAL STUDIES :

1. Use incidents reported to give them lessons on safety.
2. Cut out Ads and pictures about special holidays. The teacher could then discuss the significance of these holidays.
3. Have students identify man and women in the news.
4. Ask students to circle with different coloured crayons each—the World News, Indian News, Local News.
5. Using a large wall map of the world, pin articles in the proper area or outside it, by connecting the place with threads.
6. Clip and save headlines for an entire week. On Saturday pass these out—one per student—and have them report on the story to which that Head line refers.
7. Make a large calender of the month. Each day put the most important news headline. At the end of each month select the headline most important for a yearly calender.
8. Remove the headline from the story. Read the first few paragraphs. Have each student write his own headline. Compare this with the real headline.

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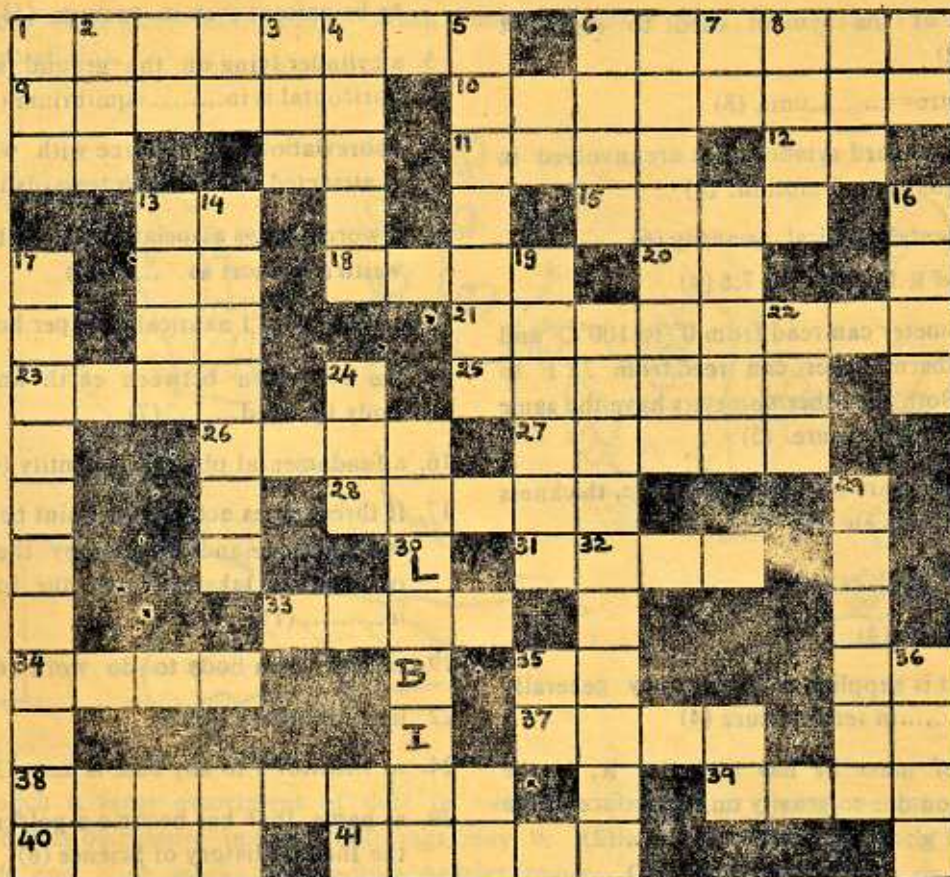
JOY in one's work is the consummate tool without which the work may be done indeed, but without which the work will always be done slowly, clumsily and without its finest perfectness. Men who do their work without enjoying it are like men carving statues with hatchets. The statue may get carved, perhaps, and is a monument forever to the dogged perseverance of the artist; but there is a perpetual waste of toil and there is no fine result in the end.

—Philips Brooks

A New Type of Test in Physics

The author, Shri D. D. Mulherkar, was formerly Head of the Department of Physics, Lady Irwin School, New Delhi. Accepting a challenge from one of his pupils to try out something different he gave his class the test that appears in this article. Mr. Mulherkar was kind enough to take this out of his records for readers of **PATHWAYS Crosswords**, carefully thought out provide an interesting way of checking on facts, spellings, technical terms and even simple mental problems.

— Editor.



Directions

- 1) You have to fill the blank squares of the Answer Sheet.
- 2) Only ONE letter should be written in one blank square.
- 3) Write in **BLOCK** letters only.
- 4) Number in brackets at the end of each clue is the number of letters forming the word to be made.

Clues Across

1. Genius of the 20th century (8)
6. a unit of force (6)
9. a device that works on the law of conservation of linear momentum (6)
10. a force of 9 newtons acts on a body of weight 49 newtons. If the body is free to move, the acceleration generated in the body will bem/sec. sec. (8)

CLUES DOWN

11. a must for any measurement (4)
12. 10^3 microns = 1.....(abbreviation) (2)
13. abbreviation for a unit of mass in the mks system (2)
15. when cars suddenly.....the passengers inside fall forward (4)
18. some of the.....Earth Elements were recently found on the moon too. (4)
20. spelling of the symbol used to represent 3.1416 (2)
21. 10^{-10} metre =unit. (8)
23. the four standard symbols that are involved in the 1st equation of motion. (4)
25. a fundamental physical quantity (6)
26. a metal of R.D. equal to 7.8 (4)
27. a thermometer can read from 0° to 100°C and another thermometer can read from 32°F to 212°F . Both the thermometers have the same of temperature. (5)
28. standard measure of diameter of wire, thickness of metal sheets etc (5)
31. a unit of length (4)
33. a unit of time (4)
34. when heat is supplied to bodies they generally show a... ..in temperature (4)
35. a planet of mass M has a radius R , if the acceleration due to gravity on the surface of the planet be ' g '; we have $gR^2 = \dots\dots\dots$ (2)
37. when a thin wire is heated to a very high temperature (as in an electric bulb) the wire will(4)
38. when the centre of gravity of a body is raised the body becomes(8)
39. a form of energy (4)
40. a fundamental physical quantity. (4)
41. force is anything that changes or.....to change the state of rest or uniform motion of a body. (5)
1. a unit of work or energy (3)
2. electrically charged atom or group of atoms (3)
3. a force of 5 newtons acts on a body and generates in it an acceleration of 0.5 m/sec. sec ; the mass of the body is.....kilograms. (3)
4. a hypothetical medium which was supposed to be present even in vacuum (5)
5. a cylinder lying on the ground with its axis horizontal is in.....equilibrium (7)
7. abbreviation for the force with which a body is attracted by the earth towards its centre. (2)
8. a word always associated with a thermometer is written in short as.. (4)
13. a velocity of 1 nautical mile per hour (4)
14. the attraction between earth and any other body is called.....(7)
16. a fundamental physical quantity (4)
17. if three forces acting at a point be represented in magnitude and direction by the three sides of a triangle taken in order, the forces will be in..... (11)
19. capacity of a body to do work (6)
22. unit of fluidity (3)
24.of 1 to any base is zero (3)
29. a name that has become a golden chapter in the Indian History of Science (6)
30. unstable (6) (three letters are already given)
32. the resultant of a number of forces acting at a point depends on their magnitudes as well as the.....between them (6)
35. same as 35-across (2)
36. unit of power (4)

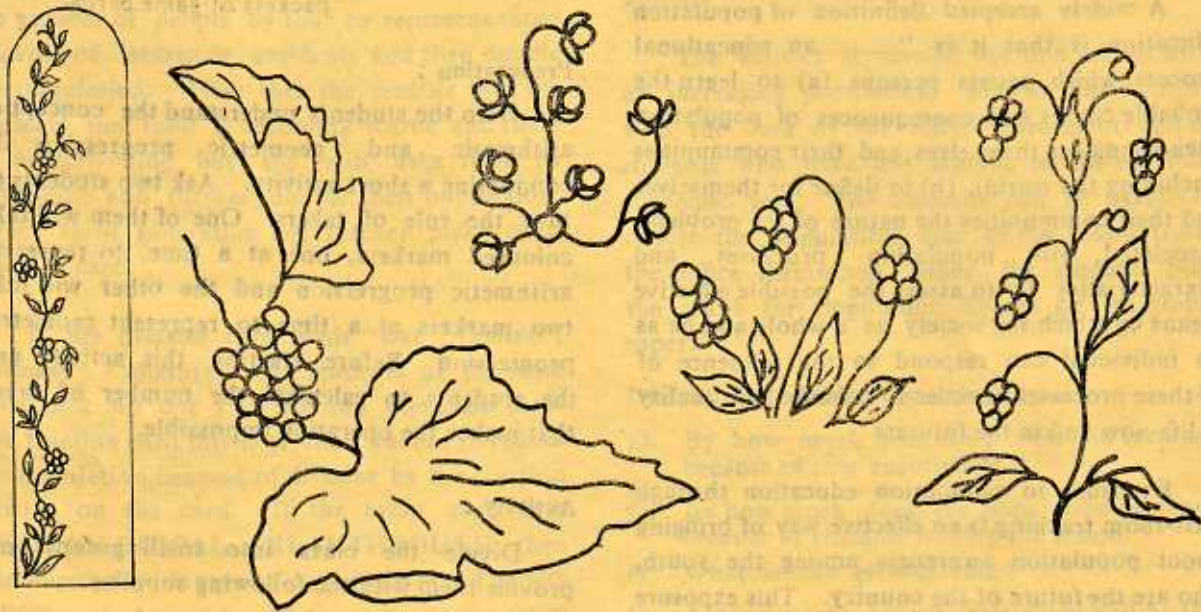


COLOURFUL DOT ART

by Iris Joseph

The more personalised a card, letter or book mark is, the more warmly it is received. With the "Three P's", paper, punch and paste you can decorate these and many other items with coloured circles punched out from construction paper, magazines, brochures and cards.

To decorate stationery, book marks; gift tags, place cards, stamp folders you will need a paper punch, white glue, toothpicks, a 3-inch square of waxed paper, face tissue, tweezers, fine felt pens and small tins,



Punch a large assortment of dots in various colours. For variation, cut dots in half. Arrange the dots by colours in tins. Gift tags may be made from a 4×5-inch sheet folded in two. Place cards and book marks will require heavier paper. On card, book mark or other project lightly draw with pencil the outline of a design. Some samples are given here. Use felt pens for the stems and foliage.

Place a dot of glue on a piece of waxed paper anchored with a weight. Pick up dots with tweezers and apply glue to back of dot with a toothpick. If working with a circle of dots, position centre dot first and press down with a piece of tissue to blot off excess glue. You will be able to create a variety of designs and enjoy the circle game "here a dot, there a dot."

[Mrs Joseph has for many years, enjoyed working on craft projects with young children. She is adept at various handicrafts including needlework, paper craft, the making of paper flowers. We hope to bring readers a few more of her ideas in future issues.]

POPULATION EDUCATION

by Arti Laroia

Population, whether it be of plants, animals, or human beings is an important subject of interest. There is an increasing concern for imparting population education in schools. This concern, is a consequence of the growing public awareness of the relation of human population to the quality of life.

A widely accepted definition of population education is that it is "..... an educational process which assists persons (a) to learn the probable causes and consequences of population phenomena for themselves and their communities (including the world); (b) to define for themselves and their communities the nature of the problems associated with population processes and characteristics (c) to assess the possible effective means by which the society as a whole and he as an individual can respond to the influence of of these processes in order to enhance the quality of life now and in the futurers"

Exposure to population education through class-room teaching is an effective way of bringing about population awareness among the youth, who are the future of the country. This exposure would enable the youth to make rational decisions about personal matters pertaining to population growth, for example, having a small sized family.

Here are two class-room activities which could be done with children to enable them to understand the consequences of population growth.

ACTIVITY 1

POPULATION AND RESOURCES

Major Concept : Population growth rate is indirectly proportional to the availability of limited natural resources.

Teaching Method : Combination of role play and simulation method.

Skills : Observation, Calculation, Thinking.

Materials : Numerous sacks containing several small pieces of different coloured paper and packets of game cards.

Preparation :

Help the students understand the concept of arithmetic and geometric progression by conducting a short activity. Ask two students to play the role of takers. One of them will take coloured markers, one at a time, to represent arithmetic progression and the other will take two markers at a time to represent geometric progression. Before starting this activity ask the students to calculate the number of takes that makes the operation impossible.

Activity :

Divide the class into small groups and provide them with the following supplies

1. Several small pieces of different coloured construction paper.
2. A package of 20 cards each having a fractional number less than one-half written on one side, e.g. $\frac{1}{2}$, $\frac{1}{3}$ etc.
3. A set of 20 EVENT cards which include 3 cards saying TECHNOLOGICAL ADVANCE, IGNORE DISASTER and the remaining saying NO HELP.
4. The teacher has a package of 10 disaster cards which include 2 WAR, 2 FAMINE, 2 DISEASE 2 MIGRATE TO THE NEAREST AREA, and 2 CUT BIRTH RATE IN HALF cards.

5. All these cards are stacked in separate piles, facing down wards.

Assign each group to represent a small area on the planet earth and start the activity with ten people in a particular area. Those ten people then follow the instructions of the teacher. The teacher tells the student that the conditions for survival on the planet are good and thus they can have two children per couple. The students add variously coloured pieces of paper to represent the new addition of population. The teacher then says that plenty of food is still available. The students are asked to reduce the number of people by four to represent those who die of diseases or accidents and then double the population. After this the teacher tells the students that food is becoming scarce and there is overcrowding but she still asks them to reproduce and further double their population. Every third generation the teacher picks up a disaster card.

If the disaster card reads "war", "famine", "disease", "migrate" the students at the same time pick up one fraction and one event card. The fraction card instructs the student to reduce the population because of disaster by the fraction written on the card. If the event card says **TECHNOLOGICAL BREAKTHROUGH** then the population is saved from disaster. The **NO HELP** cards do nothing. If the teacher gets a **CUT BIRTH RATE** card then the number of people are reduced by a single generation. Ask each group to calculate the number of people at the end of the game and observe which group had less number of children and why.

Follow - Up :

Discuss what other resources become scarce with an increase in population. Compare the population densities of developed countries with lesser developed countries and discuss how it affects availability of resources. How has technology played a role in alleviating pressures of overpopulation by making resources more easily available?

ACTIVITY 2 :

POPULATION STUDY IN A SCHOOL

Major Concept : Population growth affects availability of funds for schools.

Teaching Method : Open-ended case situation.

Skills : Calculation, measurement and Observation.

Materials : School population data, graph paper, pencil, pens, rulers.

Activity :

The activity is carried out in a school with an increasing population. Provide the students with the data of the school enrolment and of students who have left school, in the previous academic year. The students can be asked to collect the population data of the school from the office themselves. Have the students plot the graph for population figures on the graph paper.

Discuss the following questions :

- Q. By how much does the population increase because of new enrolments?
- Q. By how much does the population decrease because of students leaving the school?
- Q. What is the growth rate?
- Q. At the present growth rate, what will be the population of the school for next five years?
- Q. At the current rate of population growth, what is the doubling time? How long will it take to double again? Compare the doubling times.
- Q. How will this population growth affect the facilities available in school? Compare the facilities with another school, if you like.

Note : This activity can be adopted for an economics class (eg recording of data).

A feed-back of your reaction towards these activities, after having conducted them in your class would be greatly appreciated.

[Ms Laroia has done her M.Sc in Zoology from Delhi University and has obtained a Masters Degree in Education with specialization in Environmental Education from the USA. She is currently Director, Resource Centre, Bluebells School, New Delhi.]

Instructional Objectives : Their Value in Effective Learning

by LALIT KISHORE

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Effective instructional planning and designing have always stressed on the statement of instructional objectives so that they are of optimal help to the student. Undoubtedly, learning is effective if learning outcomes are carefully specified so that the student understands the criteria for successful academic performance and achievement.

I. Definition of An Instructional Objective :

Razik defines an instructional objective as a specific, observable and measurable aim which serves as a guide for learning and which is desired towards the eventual achievement of a general objective.

Instructional objectives are helpful in planning of instruction and evaluation of students' learning. Kilehard feels that more attention should be paid to the source of objectives, how they are stated and the role they are to play in planning curriculum and guiding instruction. According to Otto, setting a purpose to study in the form of instructional objectives is basic to effective learning.

Features of Good Instructional Objectives

To facilitate clarity in instructional objectives, Mager recommends that they be stated in behavioural forms, i.e., the activity to be displayed by the learner should be manifested and comparable to a criterion behaviour against which it is evaluated. Learning objectives so stated are characterised by action verbs such as : to define, to state, to cite, to list, to draw, to label etc. According to Bandura, the meaningfully stated objectives have two basic functions.

1. Identifying behaviours appropriate for desired learning outcomes.
2. Specifying conditions under which behaviours are expected to occur.

Popham and Baker observe that a good objective must be specific and must include post-instruction behaviour of learners. There is, however, another dimension to objective writing, a dimension which further aids the teacher in planning and evaluating his instruction

II. Action Verbs ; An Aid to writing Objectives

Instructional objectives should always be written behavioural terms. And behavioural terms are described by certain verbs called action verbs. which can be measured in explicit values. Here are a few statements which illustrate the way instructional objectives should be written.

- * Students shall be able to **define** the term umbra'
- * Students shall be able to **state** Newton's three laws of motion
- * Students shall be able to **name** five part of a camera
- * Students shall be able to **cite** three examples of longitudinal waves
- * Students shall be able to **differentiate** between mass and weight
- * Students shall be able to **draw** the diagram of the physical balance and label it.

In order to help teachers to write instructional objectives, J.K. Sood of RCE, Ajmer has compiled a list of action verbs which runs as follows. It should be kept in mind that action verbs describing the cognitive domain are measureable while those describing the affective domain cannot be measured. Nevertheless, they can be observed by the teacher by social and personal interaction with his students.

ACTION VERBS THAT ARE PRIMARILY COGNITIVE

identifies	paraphrases	answers	cites examples
constructs	publishes	mentions	classifies
demonstrates	recalls	requests	explains
dissects	associates	calculates	generalizes
reproduces	discusses	outlines	sees relationship
contrasts	relates	operates	verifies
compares	plans	instigates	infers
eliminates	quotes	initiates	predicts
sketches	suggests (an hypothesis)	writes	reasons
matches	draws	tabulates	states
analyzes	assembles	locates	illustrates
experiments	reports	uses	differentiates
designs	recites	classifies	labels
explores	compiles	translates	names
surveys	graphs	describes	
inserts	builds	enumerates	
solves	instructs	records	
interrogates	measures	defines	
photographs	completes	describes	
ranks	assists	recognises	

ACTION VERBS WITH PARTICULAR VALUE FOR THE AFFECTIVE DOMAIN

selects	objects (to an idea)	sleeps	weighs (judges)
chooses	adopts	yawns	criticizes
participates	submits	investigates	evaluates
challenges	perseveres	attempts	tests
attempts	praises	tries	delays (response)
seeks	defends	specifies	qualifies
persists	obeys	offers	designs
asks	keeps (preserves)	proposes	suggests
joins	shares	rejects	supports
gathers (information)	disputes	accepts	recommends
organizes	subscribes	consults	annotates
visits	promotes	questions	advocates
argues (a position)	spends (money)	queries	

Contd. on Page 14

Self Development & Human Relations in The Classroom

Every teacher is a Manager—a manager of children and their learning in a given situation. Many skills and attitudes are necessary to be an effective manager. In one of the articles in a journal for professional managers the following have been recommended. These are modified slightly to suit those of us in the teaching profession.

1. A Pleasant Personality

People like working for managers with a pleasant personality, and accept his instructions and authority, more readily. Watch your personality in the class room! Don't let your personal problems show in dealing with the children.

2. Be Considerate

Being considerate, and courteous towards your students does pay. Empathize with them.

3. Be Consistent

The teacher whose course is steady, whose actions are predictable and who is consistent in his actions will win confidence and cooperation from pupils.

4. Listen Thoughtfully

There is no surer way to discourage creative thinking by a pupil than to ridicule a suggestion he makes. Never dominate a discussion or conversation, but give courteous hearing to your students.

5. Involve them in Decision Making

You can build up your students' self-esteem if you occasionally ask for their counsel and help. Besides, when they feel that they have had a say in a decision, they are more likely to go along with it.

6. "Disguise"

Disguising your orders as "requests" gets better results than issuing them as "Commands".

Today's student wants and deserves more consideration than "I tell you. You do it". According to behavioural scientists, most students will rate a teacher high and will cooperate more willingly, if he or she gives orders pleasantly.

7. Delegate

Look for chances to give students small jobs. It develops self confidence in them and leaves you more time for managing the teaching-learning process.

8. Show Faith and High Expectations

Pupils tend to perform according to what is expected of them. If they know you have the confidence in them to expect a first-rate job, that's what they will usually try to give you. Conversely if you show lack of confidence and trust in them, they will try to live up to your expectations by poor performance.

9. Let Your Students Know Where They Stand

Make an objective evaluation of their performance and not of their traits and disposition. Further to get full value from such a system, you must discuss ratings with each person individually so that he can bolster his weak points, clear up misunderstandings and recognize his particular strengths and talents. In case of poor performance, it is better to discuss this with the student than to criticize him in his absence.

10. Criticize in Private & Praise in Public

If you must criticize a student, do it in private on a person to person basis. Reprimands in the presence of others will undermine morale and self-confidence. Praising people (when they deserve it) in front of others tends to raise their morale, increase prestige and strengthen self-confidence.

A SCHOOL CENSUS

Geography books often give details of the population of countries. Newspapers expose children to a variety of information about the people. Such information is usually the result of a detailed, nationwide survey—the census. This project gives children a chance to know at first-hand, the actual workings and uses of this great event.

The census as such, is a complex subject, that involves the use of many basic skills and abilities in a more sophisticated form. It would develop in the participants the skills of communication, presentation, documentation and investigation along with analytical and interpretative abilities. As the entire topic is adaptable to various intellectual levels it would be a novel experience for the students, to have the topic groupings done vertically, i.e. Class III-X, rather than the conventional horizontal groupings. This would also enable the students to develop interpersonal skills when they have to communicate out of their traditional age group. On the other hand every class would get the opportunity to study every aspect of the project equally at its level.

An interesting “activity” aspect of this project could be —

i) a visit to the Census Commissioner's office to see how they work on a large countrywide scale, i.e. how the whole ‘census’ is organised at a macro-level.

ii) a talk to the students about the ‘Census of India’ by an official from the department

iii) an exhibition of the project and its findings.

Suggested Workplan And Lay-Out

It would be a good idea to set up a School Census Commission and designate office bearers

to head each group, on lines similar to the actual census commission, e.g. census commissioner, deputy commissioner, project directors etc. Allocate duties specifically to them such as—compiling, coordinating, presenting etc. Perhaps the school captain could act as the commissioner and the prefects as the various directors.

SUGGESTED TOPICS ON WHICH INFORMATION IS TO BE COLLECTED

General:

- (1) Total figures of the number of students
 - (a) class-wise
 - (b) year wise – 1983-84/82-83 or earlier from school records
- (2) age groupings
- (3) languages
- (4) States of origin
- (5) Marks obtained-average ranges at all levels
- (6) Castes/communities/religions

All these are to be sum totals of the entire school population.

Personal Data

- | | |
|-------------------------------------|----------------------------------|
| (1) Height Ranges | Tallest to be shown)
shortest |
| (2) Weight Ranges | Heaviest
Lightest |
| (3) Hair-Colour | |
| (4) (a) Eye-Colour | |
| (b) Vision—Glasses worn by students | |
| (5) Handicapped children | |
| (6) Blood Grouping (if possible) | |

The scope and range of this field is enormous

Sociological

- (1) Number of family members (children)
 - (a) in ranges of 1-2-3
 - (b) Dominance of male/female

This is only with reference to brothers and sisters of the students

(c) Largest family in the school

(2) Parental Status

- (a) Both parents alive
- (b) Only mother alive
- (c) Only father alive
- (d) Both parents employed
- (e) Only father employed
- (f) Parents in government service
- (g) Parents in Public Sector
- (h) Parents in Private Sector

In each group the older children could carry out the collection, information analysis, presentation and lay-out. The junior children could be given the jobs of colouring the charts, writing out charts, preparing data sheets, questionnaires etc. under the guidance of the group. Children who are weak in a particular skill should be especially asked to do jobs in that area so as to overcome their weaknesses.

It will be the overall duty of the 'Commissioner' to coordinate activities, arrange schedules, ensure each group is doing the allocated jobs properly and give any form of help or assistance to group heads as and when required. He/she is also to ensure efficient and successful completion of the project on time. He/she will finally have to present the census report in the school assembly, organise the exhibitions to follow and perhaps a field trip or lecture as a follow-up to the project. Systematic planning prior to the actual collection of data is the key to success. This implies planning sessions between staff and students as also amongst student leaders themselves. At these meetings the nature of the data to be collected, the format of the questionnaires, the day(s)/time(s) when data collectors may do their work, the preparation of stencilled or handwritten record sheets, the format in which results are to be presented, allocation of duties, are some of the jobs to be completed. Obviously there is plenty of scope for developing of interpersonal communication and leadership skills.

Malini Rajendran

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III. The Value :

Stating specific instructional objectives is very vital to purposeful learning. Specifying objectives have many more values, as stated below :

1. Behavioural objectives can work as measureable criteria for student's performance.
2. Behavioural objectives sharpen the focus for learning by clarifying the instructional purpose.
3. Behavioural objectives increase the student's sense of security.
4. Behavioural objectives help in setting instructional priorities
5. Behavioural objectives help in increasing the instructional consistency.

Kibler observes that the influence of behavioural objectives is the sense of security a student experience when he knows what specifically is expected from him in a course and the conditions under which he will be expected to exhibit those competencies. Psychologists suggest that generalized fears cause greater emotional anxiety than specific well-defined fears. Behavioural objectives can help students understand specific requirements of a course and also reduce the amount of generalized anxiety about the course requirements.

MOISTURE MAKERS

Transpiration is the evaporation of water from plant surfaces, primarily the leaves, into the air. Most plants transpire approximately 75% of the water taken in by the roots, through the small openings (*Stomata*) found on the leaf and stem surfaces. The stomata regulate transpiration by opening and closing. Fluctuations in transpiration occur seasonally and depend on environmental factors such as wind, light, moisture, temperature.

Here is a way of setting up a variety of pupil experiments to study this process. First prepare cobalt chloride paper by soaking small pieces (2 cm x 5 cm) of filter paper (or any other absorbent paper) in a solution of cobalt chloride. This can be easily made by dissolving two teaspoons of cobalt chloride (available from your chemistry laboratory) and one teaspoon of salt in four teaspoons of water. Dry out the paper by hanging it up with clothesclips. When dry it will be blue in colour. When moist it turns pink.

Place a small piece of clear cello tape on either side of a small area of one piece of treated paper. This portion will remain blue, and the colour change (if any) in the remaining sections will be easily visible. Cobalt chloride paper may be fixed on to leaves using paper clips. The paper and the leaf should be wrapped in a plastic bag. (Why?). Allow 5-15 minutes for the colour change.

Here is a variety of simple experiments which students can carry out.

1. Compare the time it takes different leaves to turn the paper pink.
2. Compare transpiration of a dead leaf with a live leaf attached to the same tree.
3. Compare transpiration of a thick juicy leaf (succulent) with a flat thin leaf.

4. Compare transpiration of a hairy-surfaced leaf with a smooth surfaced leaf.

5. Compare transpiration of a leaf in the shade with a leaf of the same tree which is the same size and shape-but is in the sun.

6. Compare the transpiration of a small and a large leaf on the same plant.

7. Compare the transpiration of a stem with a leaf on the same plant.

8. Compare the transpiration of a thin leaf (like a pine needle) with a broad leaf.

9. Older students could set up experiments to assess the effects of excessive watering on transpiration. Choose two plants of the same kind and approximately the same size. Label the plants A and B. Water plant A the day before and also just before measuring the rate of transpiration. Do not water plant B. Compare the results obtained on both plants.

10. Another exercise could involve students in checking on the rate of transpiration at different times of the day.

11. Potted plants in metal or plastic containers with no drainage holes could help in another experiment. The plants are watered *only once*. Their soils are covered with foil or plastic sheet to prevent water loss due to evaporation. Then plants and their containers are weighed.

An identical pot containing soil and water is set up as a control. Instead of a plant, it contains only a wooden stick. The soil surface in the control pot is also covered and it is weighed.

The potted plants and the control are weighed every other day. The difference in weight loss between the control and experimental pots is the water lost through transpiration. ●

Rainy Day Activities

—For Younger Pupils

Rain can stimulate indoor and outdoor learning in individuals as well as in groups. Two children watching the raindrops fall encourages conversation. One often helps the other observe carefully and describe what is seen. Here are some ideas and questions. We are sure you can add to the list.

What is the shape of a raindrop? Which drops seem to be separate? What happens if they join together?

(Where do you think would be a good place to watch raindrops in a row, moving, joining up, falling etc.?)

*Listen to the sound of the rain on different surfaces on leaves on the road, on window panes, on a tin roof, falling into empty tins and bottles placed outside. Write words describing these sound—similes, phrases, adjectives.

*Do the above activity many times. Observe and listen to light, heavy and pouring rain; to rain driven against windows by the wind. Use these words often so that children make the association with the volume of rain they see, hear and feel.

*There may be no rain on the window pane, yet is it raining outside. How can this happen? What gives you the clues to your answer?

*After the rain, go out and look for—areas where rain drops make the biggest splash, areas where there are puddles...where these puddles are the biggest...where these puddles are the deepest.

areas where rivulets are forming...where they run slowly... where they run fastest. Ask questions...why did this happen?

*Collect rain water as it falls in ice cream cups. Collect rain water from different sources after the shower—from a puddle, from the water draining off the roof etc. Compare these samples. Discuss ways of 'cleaning up' the water.

(What happens if you get muddy water from taps at home?)

*Look at rain water draining away from roofs. Are there special channels to do this? How is the rain made to go into these channels?

How soon do the roads of your city get cleared after a heavy shower? What do you think happens to the rain water? Is there anything similar to the rain draining away from the roof?

*Look at the trees in your school garden after the rain. What do they look like? What does it smell like outside? What happens if you shake the branches of the trees? Why?

*On a hot summer day, rain often steams off the roads and pavements. Have children observe this. Explain what produces the steam. In what way does it feel different to have a light shower on a day in April (or any very hot day) and a day in September?

*Make a collection of a wide variety of materials—foil, wax paper, tissue paper, newspaper cardboard, plastics of different kinds, cloth of different kinds, rubber etc. Sort these out into those that will get 'wet' in the rain and those that won't. Test your materials—preferably in actual rain conditions, and see if you sorted them correctly.

What materials can be used for rain-coats? for protection in a light shower? How many layers of newspapers (if at all possible) might give you protection in a light drizzle?

*Collect rain (as it falls) in an assortment of clear bottles of different sizes and shapes. Will all of them collect the same amount of rain? Are the levels of water in them the same? why? Can you use one of them as a rough and ready rain gauge to compare the rainfall on different days? What will you do if the bottle has a very odd, varying shape? Can you use an opaque tin for your gauge? You cannot see the water level; so what will you do?

Some Important Questions On Environmental Studies

Almost all schools today lay increasing stress on Environmental Studies especially in primary classes. We reprint below, with modifications, some questions suggested by a teacher of Environmental Studies. They appeared in *PATHWAYS*, April 1979 issue. It is worthwhile to keep thinking of the answers to these questions. They will give us an honest self-appraisal of how we are doing our job.

1. Are the children spending too much time making charts, building up attractive files. What is the purpose of such activity—display of work on the class bulletin boards during the term or an annual Exhibition? How much true learning is going on?

2. Are the children involved in **child-centred activity**? or are they only collecting information and compiling a scrap book?

3. Do I plan my work well ahead or do I decide what to do next just before I enter the class?

4. Do I give children enough opportunities to **SPEAK** of their experiences or do I insist that they have to write down everything?

5. Do I ask children to amass collections **OVERNIGHT** or do I give them a reasonable time? With little children do I tell them how many 'things' to collect? Does it become a competition to see which student brings in the largest collection? Do I suggest things which

children might be able to collect **ON THEIR OWN**—rather than bringing in collections made by parents?

6. Is my work always aimed at the age-group of my class? Do I aim too high?

7. Does all work in the Environmental Studies time come to a stand-still for a lack of stationery—or do I improvise?

8. Am I always giving too many instructions? Do I permit the children to discover for themselves; to learn from their mistakes?

9. Do I encourage suggestions from the children on what they would like to study, on new ways of branching out from a topic? Or is my lesson plan rigidly fixed in advance?

10. Do I plan work of the 'not so bright ones' or is it only the 'bright gems' of my class who are interested and occupied all the time?

11. Do I periodically check, as work proceeds that all children get opportunities to develop a wide range of skills? that there is no imbalance?

12. Do I make an effort for continuous assessment—perhaps write a comment in the child's diary? Or is there another dreary examination, for which facts have to be learnt (memorised?) and repeated? Am I aiming at acquisition of this factual knowledge or development of skills in children?

Do not depend on doctrines, do not depend on dogmas, or sects, or churches, or temples; they count for little compared with the essence of existence in man, which is divine; and the more this divinity is developed in a man, the more powerful is he for good. Earn that spirituality first, acquire that, and criticise no one, for all doctrines and creeds have some good in them. Show by your lives that religion does not mean words, or names, or sects, but that it means spiritual realisation. Only those can understand who have perceived the Reality. Only those who have attained to spirituality can communicate it to others, can be great teachers of mankind. They alone are the powers of light.

—Swami Vivekananda

A Nutrition Game

Convert carrom into a game to teach children the ingredients of a balanced diet and the names of foods containing important nutrients. On each of the four sides of the carrom board paste the names of any four nutrients, Say carbohydrates, proteins, vitamin C and vitamin B - Complex. Each coin is covered by a disc of paper bearing a picture and the name of a food item rich in one of these nutrients. Marks are allotted on a 5 point scale to these foodstuffs depending on how much of the nutrient they contain. These marks are tabulated on a key or score card which is made available to the players at the end of the game. Some samples are given here. Keep in mind the most important nutrient available in each food,

	Carbohydrate	Protein	Vitamin C	Vitamins B
Milk	1	5	0	4
Bread	5	2	0	1
Sugar	5	0	0	0
Spinach	0	0	5	0
Tomatoes	0	0	4	0
Peanuts	0	5	0	0
Guava	0	0	5	0

Two or four players participate. The aim of the game is to collect as many coins of foodstuffs rich in the nutrient named on their own side of the board. If the striker goes into the pocket, two penalty points may be levied. At the end of the game the player with the most points wins.

By varying the nutrients children can be made to quickly identify the foodstuffs which contain them. They might end up by planning their own menus for a balanced diet which contains all the required nutrients.

YOUR ATTENTION PLEASE

The annual subscription for **PATHWAYS** is Rs. 3/-. Please send money orders/cheques to the Educational Planning Group, 4 Raj Niwas Marg, Delhi 110054. **Pathways** is issued in February, April, August and November each year. Subscriptions are valid for a calendar year. Those who join our subscribers later in the year will be sent the back numbers for that year. Remember to send your complete address with the M.O, including the PIN code number to avoid delay and losses in the post.

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We must take care to be tactful, and not mix ourselves up in other people's business. On the other hand we must not forget the danger lurking in the reserve which our practical daily life forces on us. We cannot possibly let ourselves get frozen into regarding everyone we do not know as an absolute stranger. No man is ever completely and permanently a stranger to his fellow man. Man belongs to man. Man has claims on man. Circumstances great or small may arise which make impossible the aloofness which we have to practise in daily life, and bring us into active relations with each other, as men to men. The law of reserve is condemned to be broken down by the claims of the heart, and thus we all get into a position where must step outside our aloofness, and to one of our fellow-men become ourselves a man.

From *My Childhood and Youth* by Albert Schweitzer